

and illdefined blackish brown spots on the cell, another more defined black spot at the end of the cell; at apical third is an indistinct yellowish costal streak and around the edge is a postmarginal black line on the base of the cilia; cilia light gray. Hindwings light fuscous. Abdomen dark fuscous with yellowish anal tuft. Legs blackish fuscous with narrow ochreous annulations. Alar expanse: 12 mm.

Habitat: Victoria, British Columbia.

U. S. Nat. Mus. Type No. 22110.

Received from Mr. W. Downes. This is the so-called "Strawberry Crownborer," on which there is a considerable economic literature, but which has never received a specific name. The species is exceedingly close to *Aristotelia absconditella*, Walker, which feed on *Polygonum*; the lighter colored terminal joint of the labial palpi and minute differences in the white annulations of the antennae are the only slight distinctions, but slides of the male genitalia prove the separation correct.

In the National Museum are also specimens bred from strawberry at Corvallis, Oregon.

AVOCADO SEED WEEVILS.

BY H. S. BARBER, *Bureau of Entomology.*

Since the writer's 1912 note on the large weevil (*Heilipus lauri* Boh.) reared from Central American seeds of avocado, (*Persea spp.*) a federal quarantine has become effective against importation of these seeds, and in this connection the weevil has been mentioned several times. Together with three other seed-infesting weevils mentioned hereafter, it was used in the seed fumigation experiments described by Sasser 1915. A recent paper by Hoyt 1918 warns the avocado growers of Florida against this possible pest and mentions the feeding injury by the adult in confinement but no field observations (except those of Gandara and Inda 1914, in which the damage by some bark-borer and perhaps other pests also seems to have been confused with that by *Heilipus*) have yet offered us any basis upon which we may satisfy our curiosity as to the nature or extent of commercial damage liable from this weevil under its most favorable conditions. We are still in ignorance of the principal part of its biology since the only observations of which I am aware are based upon prepupal larvae and pupae found within imported seeds and upon the adult beetles issuing therefrom. One of these latter lived under my observation for four and a half months, most of the time confined upon a potted seedling avocado about 14 inches high, which it killed by its voracious feeding upon the leaves, buds, and finally upon the bark. Before being placed

upon this plant it had fed upon ripe avocado fruit and, when starved to it, upon the seed of the same.¹

Two quite distinct though closely related forms of adults were mentioned in the 1912 note and it was then hoped that more material would soon be available, as well as observations on habits in its native home, but the infested seed subsequently received in Washington seems to have contained only the larvae of a somewhat smaller weevil often occurring a dozen or more in a single seed, and which when reared proved to be the species described below as *Conotrachelus perseae*. I know of no one who has noticed either weevil in its wild state. An excellent photograph of very serious injury to the pulp surrounding the seed was made by Wilson Popenoe at Panajachel, Guat. in Jan. 1917, and will appear in his forthcoming paper on Guatemalan Avocados (U. S. Dept. Agr. Bull. 743, pl. XI). The larvae there shown are certainly weevil larvae (probably *C. perseae*), but when found were mistaken for the larvae of the moth *Stenomoma* sp.

The two forms of *Heilipus* are so distinct in habitus that it seems best to use distinctive names for them but it is more than likely that intergrading forms will be discovered in avocado seed from other tropical American localities and require the reduction of the new form to the rank of a subspecies. In the ten specimens before me the relative lengths of the rostrum may be shown by the decimal quotients found by dividing the measured length of the beak (from margin of eye) by the measured length of the pronotum (before scutellum) which are as follows:

H. lauri ♂♂, 1.42, 1.45, 1.47; ♀♀, 1.81, 1.84, 1.86.

H. pittieri ♂♂, 1.56, 1.68; ♀♀, 2.19, 2.45.

The two forms are distinguishable as follows:

Ground color piceous, legs concolorous; elytra with conspicuous transverse antemedian and subapical squamose patches; rostrum of ♂ less than $1\frac{1}{2}$ times length of pronotum, of ♀ less than twice pronotal length. Habitat in seeds of *Persea persea* from Mexico. *Heilipus lauri* Boh.

Ground color red, legs bicolored; no elytral fasciae; rostrum of ♂ more than $1\frac{1}{2}$ times pronotal length, of ♀ nearly $2\frac{1}{2}$ times pronotal length. Habitat in seeds of *Persea pittieri* from San Jose, Costa Rica. *Heilipus pittieri* n. sp.

Heilipus lauri Boh. 1845. The type locality in Mexico from which Wahl (Professor of Botany in Copenhagen?) obtained the infested avocado seed can probably never be located; Champion 1902 saw two specimens from Capulalpan (Sallé); Barber 1912 had seen three specimens from the U. S. that had issued from im-

¹ This was a ♀ specimen of *H. lauri*, received from A. S. Hoyt Aug 1, 1913, which he had taken at Los Angeles, Cal., out of a seed from a dealer in Mexico City, and which died Dec. 19.

ported seed of unknown source; Pierce 1917 added no new records; and Hoyt 1918 must have seen a number of specimens found in seeds received in Los Angeles, Cal. from a dealer in Mexico City for he kindly has sent three examples to the Bureau of Entomology.

The six examples before me are very dark brown with short decumbent fulvous or cinereous hairs in the transverse wrinkles of the elytra; on the latter are two conspicuous transverse bands of densely placed hairs, one at basal two-fifths and lateral fourth, broadly interrupted at middle, the other at apical fourth narrowly interrupted at suture but nearly obsolete on flanks. Length (rostrum excepted) 14-15 mm.

Heilipus pittieri n. sp. (*H. lauri* (part) Barber 1912, Pierce 1917.) Similar to *H. lauri* but differs in the bright rufous color of the integument and uniform disposition of the elytral vestiture as well as in the longer rostrum, stronger development of the mesosternal tubercle and relatively slightly narrower pronotum. Length (rostr. excl.) 13, 14¹/₂, 15¹/₂, 16¹/₂ mm.; length of rostrum ♂, 5 to 5.7 mm., ♀, 8.1 to 9.8 mm.

The type and three paratypes (U. S. N. M. Type No. 22007) issued at Washington, D. C. in 1912 from a small lot of seeds of *Persea pittieri* Mez. received by the Bureau of Plant Industry, U. S. Department of Agriculture, from Mr. Carlos Werkele in San Jose, Costa Rica.

CONOTRACHELUS.

The most common weevil larvae found in imported avocado seed by the federal inspectors since 1912 was reared from three lots of seed, and proved to be as recorded by Sasser 1918, a *Conotrachelus* which we were unable to identify among the 189 species of this genus treated by Champion in the *Biologia Centrali-Americana* (Vol. 4, pt. 4, 1904-6) until after its close relationship with Floridian specimens of *C. serpentinus* Boh. was noticed. Although females of the two forms are often almost indistinguishable the characters of the males are so different that there seems to be no alternative but to add the hundred-ninetieth species to the list of Central American *Conotrachelus*. The males of both species have the rostrum shorter before the antennal sockets and have a pair of tufts composed of two or three short tactile hairs near the apex of the last ventral segment. The two species here distinguished may be recognized in the males as follows:

♂ with hook on anterior tibia flattened, bidentate, apex shallowly emarginate; rostrum conspicuously pubescent in basal two-thirds; antennae inserted at apical fifth; metasternum with very large, shallow concavity, the posterior margin of which is elevated into a strong, transverse, arcuate and finely crenulate ridge; first abdominal segment without median impression; hind tibia longer and more slender, with inner margin obliquely truncate and biserially ciliate in apical fourth, and with a strongly curved apical

hook; aedeagus flattened, less strongly chitinized, apex broadly truncate and bearing lateral patches of very fine, short pubescence, the opening hardly double the width of the chitinized border. Length, $6\frac{1}{2}$ to 7 mm. Habitat in seeds of *Persea* from Guatemala City.

Conotrachelus perseae n. sp.

♂ with anterior tibial hook simple; rostrum pubescent in basal third; antennae inserted at apical third; metasternum with small medium posterior impression; first abdominal segment broadly, shallowly impressed; hind tibiae shorter, stouter, with only a vestige of the inner apical emargination and with an inconspicuous hook; aedeagus strongly convex, heavily chitinized, with opening about five times the width of the lateral border, apex rounded or narrowly truncate. Length, $5\frac{1}{2}$ to 6 mm. Habitat, Cuba, Florida and Georgia. (*C. ventralis* Lec. 1878.)

Conotrachelus serpentinus Boh.

Conotrachelus perseae n. sp. Larvae believed to be of this species are before me from seven lots of avocado seed and from three of these lots adults have matured in my breeding jars. The first adults reared are from seed which came from Coban, Alta Vera Paz, Guat. and are smaller, paler in color, with almost uniformly, pale yellow vestiture and it is feared they may have issued under abnormal conditions in the breeding jar, so specimens from the two other lots from Guatemala City which are supposed to be more normal, have been chosen as types, and the following description was drawn from two live and freshly emerged but fully hardened females:

Integument very dark piceous (almost black), shining. Vestiture moderately dense and composed of hairs of three colors intermixed—rose-red, rather pale brownish, and a few white; the first being quite dense on the front, the humeri, and base of second interstitial space of elytra and on the legs; the brownish hairs being confined principally to the disc of the elytra, and the white occurring conspicuously in the punctures of the metasternum and abdomen, in the large serial punctures of the elytra and less prominently in small, irregularly placed spots and bands on the disc of the elytra. Elytra with alternate interspaces carinate, the two inner ones much less prominent on the disc, the two outer ones uniting in a rather strong humeral prominence. Abdomen and metasternum shining, very sparsely punctate; a strongly elevated oblique ridge connecting the middle and hind coxae and ending in a slightly produced tubercle in front of the hind trochanter; median area of metasternum finely crenulate behind and with similar transverse sculpture in front; last three abdominal segments narrowly margined with fine pale pubescence; femora very strongly toothed, with the rosy hairs more densely placed in illdefined postmedian and subapical bands.

Type, allotype and 14 paratypes No. 22008 U. S. N. M.

The larval galleries in the seed reach a diameter of about 4 mm. and are tightly packed with frass. When the larvae are

numerous the seed may be badly riddled but the germ is often not injured by the larvae whose presence in the seed cannot be detected except by cutting into their galleries unless they have started to leave the seed for pupation. This transformation is usually accomplished in the ground but larvae sometimes pupate in rotten seeds. The pupal period lasts about two weeks and the adults do not harden very rapidly. It is supposed that eggs are laid in the young fruit—otherwise one would expect to find a noticeable entrance hole in the seed covering. If the larvae shown in the injured avocado fruit illustrated by Wilson Popenoe 1919 (Plate XI) are in truth this species, as I believe they probably are, its habits of attack in the growing fruit must be similar to that of *C. nenuphar* in peach, but nothing to indicate this was seen in the material reaching my hands from the following sources:

A. S. Hoyt of Los Angeles, Cal., examined quantities of seed from a dealer in Mexico City finding larvae and pupae of *Heilipus lauri* and a Scolytid (mentioned below) but among the few specimens of the former now in the National Collection there are two larvae now believed to be this *Conotrachelus* but which, when received were mistaken for young larvae of the *Heilipus*.

O. F. Cook collected seed of a "hard shelled" avocado at Coban, Alta Vera Paz, Guat., many of which were infested with *Conotrachelus* larvae and *Caulophilus* larvae, pupae and adults. These were received by me June 9, 1914 and from them pupae were secured in July and early August, and adults were reared.

Wilson Popenoe purchased seed in the markets in Guatemala City which was received in Washington in several lots, two adults being reared in Feb. 1917 and twelve more in Feb., Mar. and early April 1918, the latter from seed purchased in November 1917. In this lot there was much parasitism by a Chalcid (Eucyrtid) whose black pupae formed a raspberry-like cluster all standing upright in the pupal cell of their host. Larvae are also preserved from seed grown in Panajachel, Guat., about Jan. 5, 1917, but I have seen no adults from this lot. Avocados are brought into the markets by the natives from long distances, I am informed, so the specimens here described may be native in some other section of that country although undoubtedly established about cities.

Conotrachelus serpentinus Boli. 1837 was described from Cuba and has been mentioned by Jaq. Duval 1856, by Suffrian 1872 and by Gundlach 1891? What seems to be the same species from Florida was described by LeConte 1878 as a new species, *C. venialis* under which name Schwarz 1890 recorded it as found by him exclusively upon *Persea carolinensis* (= *P. borbonia*), within Psyllid galls on which, he believed the larvae developed. Blatchley and Leng 1916 redescribe the species under the name

serpentinus and state that *ventralis* is a synonym. The National Collection contains 27 specimens as follows: a topotype of *ventralis* from Enterprise Fla. June 14; eight examples from Lake Worth, Fla. (Soltau Coll.); Ten examples from Cocoanut Grove (labelled Biscayne Bay) Fla. Apr. 30, May 16 (Hubbard and Schwarz); two from Miami, Fla. (Wickham); one from St. Lucie, Fla. Apr. 20 (Hubbard and Schwarz); one from St. Catherine Isl., Ga. April 19 (Hubbard and Schwarz) and one from Savannah, Ga. (G. Noble—larvae in fruit of *Persea catesbyiana*)¹ besides three examples from Cayamas, Cuba, Mar. 2, 3, and May 22 (Schwarz). These latter are so like the others that I believe the LeConte name must remain a synonym although a comparison of the aedeagus of a Lake Worth and a Cayamas specimen show some slight differences in outline of apex, the Cuban form being slightly more deflexed and rounded than the Florida example which is slightly truncate apically. The forms treated as *serpentinus* by Champion 1904 probably belong partly to this species and partly to the species above described as *persiae* but no male specimen before me has the hind tibia of the shape indicated in his figure 19b. To the above distribution should probably be added his record from Jamaica.

Other Insects.

Another weevil (*Rhyncolus lauri*) from seeds of avocado from Mexico, was described about eighty years ago by Gyllenhal, but no one seems to have been able to identify this species. Champion 1909 states that the type could not then be found in the Stockholm Museum but that the species probably does not belong in *Rhyncolus*. Except for the pale elytra more than three times as long as the prothorax the original description might apply to what we are now calling *Caulophilus latinasus* Say, which Boheman redescribed from material sent by, say, only nine pages ahead of Gyllenhal's description of *lauri*. *C. latinasus* seems to be native in our Southern States and Champion 1909 adds Mexico, Guatemala and Madeira to the known distribution but the specimens I have seen vary considerably and may not all be *latinasus*. Injury to avocado seeds by this species has been mentioned by Schwarz 1912, Sassocer 1915, Blatchley and Leng 1916, Pierce 1917, Popenoe 1918, Hoyt 1918, and by Popenoe 1919.

The small Scolytid from a Panama avocado seed mentioned by Schwarz 1912 has not yet been described but Dr. Hopkins believes it represents a new genus related to *Spermatoplex*. The Scolytid mentioned by Sassocer 1915 and by Hoyt 1918 seems to

¹ This plant is now listed in *Ocotea* but is presumably a misdetermination of *Persea borbonia*.

be *Pagiocerus rimosus* Eich. which, according to Blandford 1896 is widely distributed in tropical America from Chili to Mexico and Cuba, and which is recorded from Florida by Hopkins 1907, Swaine 1909, and Blatchley and Leng 1916, boring in seeds of *Persea borboni*, *Anona glabra* and *A. cherimolia*, and in corn. Specimens received alive from Mr. Hoyt were reared by the writer, through several generations in Avocado seed, and the same species was recently found infesting Central American corn at Quarantine in San Francisco, so the species may be a pest of various stored products.

Since avocado culture in Florida appears to be assuming almost the proportions of an industry, it may be permissible to mention two other insects that are not seed weevils but which may become important. Mr. Schwarz believes that Ashmead confused the two Florida swamp trees, *Magolia glauca* and *Persea borbonia* in his field observations and that *Trioza magnoliae* Ash. lives upon the latter and not, as stated by Ashmead 1881 and quoted by Crawford 1914, upon the former. Crawford remarks upon the similarity between *magnoliae* and *koebelii* which latter, Kirkaldy 1905 described from galls on *Persea gratissima* in Morelos, Mex., the species being "very destructive." Whether or not the two named forms prove to be synonyms, it is evident that the Florida form may adapt itself to, and become destructive to, cultivated avocado.

Cryptorhynchus ferratus is recorded by Schwarz 1890 as infesting only branches of *Persea carolinensis*, in Florida, instead of oak. VanDine 1909 records *Xyleborus immaturus* attacking avocado, and Perkins 1913 mentions two more Scolytids, *Hypothenemus eruditus* (?) and *Crossotarsus externedentatus* as boring in large avocado trunks in Hawaii. A single specimen of an unknown genus of Cryptorhynchid weevils was found in an avocado flower-bud received in alcohol in 1915 from the island of Guam, the vial being labeled "Avocado flowers attacked by insects" but we were unable, from the accompanying letter or from the samples received, to satisfy ourselves as to the nature or cause of the injury.

There are probably many other insects already reported as of economic interest in relation to the culture of this tree, but it would be out of place here to more than mention that fourteen species of Coccids and five other insects not mentioned above are listed as dangerous by Pierce 1917 and that a few more Coccids and an undermined species of the Lepidopterous genus *Stenoma* are mentioned by Sasser 1918 who tells me that the larva of the latter eats galleries in the seed similar to those of the two large weevils, but easily distinguishable from them by the presence of loosely packed lepidopterous frass-pellets. Popenoe 1919 also refers to this moth.

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EXPLANATION OF PLATE 2

1. *Heilipus lauri* Boheman, ♂. Mexico. ×4
 2. *Heilipus pittieri* n. sp. ♂ Type. Costa Rica. ×4
 3. *Heilipus pittieri* n. sp. ♀ Allotype. Costa Rica. ×4
 4 and 5. *Conotrachelus perseae* n. sp. ♂ Paratype. Guatemala. ×4

Actual Date of Publication, March 18, 1919.